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10/527,649	07/12/2005	Gordon Calundann	12834-00010-US	2238

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CONNOLLY BOVE LODGE & HUTZ, LLP  
P O BOX 2207  
WILMINGTON, DE 19899

EXAMINER
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SHUMATE, ANTHONY R

ART UNIT	PAPER NUMBER
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1797

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PAPER

**Please find below and/or attached an Office communication concerning this application or proceeding.**

The time period for reply, if any, is set in the attached communication.

<b>Office Action Summary</b>	<b>Application No.</b> 10/527,649	<b>Applicant(s)</b> CALUNDANN ET AL.	
	<b>Examiner</b> ANTHONY SHUMATE	<b>Art Unit</b> 1797	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

### Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

### Status

- 1) ☒ Responsive to communication(s) filed on 23 July 2008 and 14 March 2005.
- 2a) ☐ This action is **FINAL**.                      2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

### Disposition of Claims

- 4) ☒ Claim(s) 1-27 and 29-33 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1-27 and 29-33 is/are rejected.
- 7) ☒ Claim(s) 4 is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

### Application Papers

- 9) ☒ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

### Priority under 35 U.S.C. § 119

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All    b) ☐ Some \*    c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
  2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
  3. ☒ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

### Attachment(s)

- |   |   |
|---|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892)   | 4) <input type="checkbox"/> Interview Summary (PTO-413)<br>Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948)  | 5) <input type="checkbox"/> Notice of Informal Patent Application                       |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08)<br>Paper No(s)/Mail Date <u>23 July 2008 and 9 January 2008 and 6 September 2005 and 14 March 2005</u> . | 6) <input type="checkbox"/> Other: _____  |



## **DETAILED ACTION**

### ***Summary***

1. This is the initial Office action based on the 10/527,649 application filed 14 March 2005.
2. Receipt is acknowledged of papers submitted under 35 U.S.C. 119(a)-(d), which papers have been placed of record in the file.
3. Claims 1-27 and 29-33 are pending and have been fully considered. Claims 1, 4, 5, 7, 8, 21-26, 29, 31 were amended, and claim 33 is new. The amendments of claims 1, 4, 5, 7, 8, 21-26, 29, and 31 and new claim 33 are supported by the originally filed disclosure.
4. Receipt is acknowledged of papers submitted under 35 U.S.C. 119(a)-(d), which papers have been placed of record in the file.

### ***Information Disclosure Statement***

5. The listing of references in the specification is not a proper information disclosure statement. 37 CFR 1.98(b) requires a list of all patents, publications, or other information submitted for consideration by the Office, and MPEP § 609.04(a) states, "the list may not be incorporated into the specification but must be submitted in a separate paper." Therefore, unless the references have been cited by the examiner on form PTO-892, they have not been considered.

### ***Specification***

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6. Applicant is reminded of the proper language and format for an abstract of the disclosure.

The abstract should be in narrative form and generally **limited to a single paragraph** on a separate sheet within the range of 50 to 150 words. It is important that the abstract not exceed 150 words in length since the space provided for the abstract on the computer tape used by the printer is limited. The form and legal phraseology often used in patent claims, such as "means" and "said," should be avoided. The abstract should describe the disclosure sufficiently to assist readers in deciding whether there is a need for consulting the full patent text for details.

The language should be clear and concise and should not repeat information given in the title. It should avoid using phrases which can be implied, such as, "The disclosure concerns," "The disclosure defined by this invention," "The disclosure describes," etc.

The abstract of the disclosure is objected to because the abstract contains more than a single paragraph. Also, the abstract of the disclosure is objected to because the first sentence of the abstract is not a complete sentence and is not punctuated. Correction is required. See MPEP § 608.01(b).

### ***Claim Objections***

7. Claim 4 is objected to under 37 CFR 1.75(c), as being of improper dependent form for failing to further limit the subject matter of a previous claim. Applicant is required to cancel the claim(s), or amend the claim(s) to place the claim(s) in proper dependent form, or rewrite the claim(s) in independent form.

Claim 4 simply lists compounds without relating them to the claimed invention.

### ***Claim Rejections - 35 USC § 101***

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8. 35 U.S.C. 101 reads as follows:

Whoever invents or discovers any new and useful process, machine, manufacture, or composition of matter, or any new and useful improvement thereof, may obtain a patent therefor, subject to the conditions and requirements of this title.

***Claim Rejections - 35 USC § 112***

9. The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

10. Claim 10 is rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

A broad range or limitation together with a narrow range or limitation that falls within the broad range or limitation (in the same claim) is considered indefinite, since the resulting claim does not clearly set forth the metes and bounds of the patent protection desired. See MPEP § 2173.05(c). Note the explanation given by the Board of Patent Appeals and Interferences in *Ex parte Wu*, 10 USPQ2d 2031, 2033 (Bd. Pat. App. & Inter. 1989), as to where broad language is followed by "such as" and then narrow language. The Board stated that this can render a claim indefinite by raising a question or doubt as to whether the feature introduced by such language is (a) merely exemplary of the remainder of the claim, and therefore not required, or (b) a required feature of the claims. Note also, for example, the decisions of *Ex parte Steigewald*, 131 USPQ 74 (Bd. App. 1961); *Ex parte Hall*, 83 USPQ 38 (Bd. App. 1948); and *Ex*

*parte Hasche*, 86 USPQ 481 (Bd. App. 1949). In the present instance, claim 10 recites the broad recitation greater than or equal to 10, and the claim also recites preferably greater than or equal to 100 which is the narrower statement of the range/limitation.

11. Claim 12 is rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

A broad range or limitation together with a narrow range or limitation that falls within the broad range or limitation (in the same claim) is considered indefinite, since the resulting claim does not clearly set forth the metes and bounds of the patent protection desired. See MPEP § 2173.05(c). Note the explanation given by the Board of Patent Appeals and Interferences in *Ex parte Wu*, 10 USPQ2d 2031, 2033 (Bd. Pat. App. & Inter. 1989), as to where broad language is followed by "such as" and then narrow language. The Board stated that this can render a claim indefinite by raising a question or doubt as to whether the feature introduced by such language is (a) merely exemplary of the remainder of the claim, and therefore not required, or (b) a required feature of the claims. Note also, for example, the decisions of *Ex parte Steigewald*, 131 USPQ 74 (Bd. App. 1961); *Ex parte Hall*, 83 USPQ 38 (Bd. App. 1948); and *Ex parte Hasche*, 86 USPQ 481 (Bd. App. 1949). In the present instance, claim 12 recites the broad recitation a thickness of from 20 to 4000  $\mu\text{m}$ , and the claim also

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recites a thickness from 30 to 3500  $\mu\text{m}$  which is the narrower statement of the range/limitation.

12. Claim 18 is rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

Claim 18 describes the phrase, "it," which renders the claim indefinite.

The phrase "it" could refer to the aromatic tetraamino compound, the polymer or the support.

13. Claim 19 is rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

Claim 19 describes the phrase, "the catalyst is located on the membrane according to the invention," which renders the claim indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

14. Claim 24 is rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.



Claim 24 recites the limitation "electrode" in at least one electrode as claimed in claim 1. There is insufficient antecedent basis for this limitation in the claim.

15. Claim 27 is rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

Claim 27 recites the limitation " step F)" in the removal of the phosphoric acid in step F) is carried out. There is insufficient antecedent basis for this limitation in the claim.

16. Claim 29 is rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

Claim 29 is dependent upon claim 1. Claim 29 and claim 1 both claim a polymer which is based on polyazoles by a process. The process of claim 29 differs from claim 1, therefore claim 29 is indefinite as to what product is being claimed.

17. Claim 30 is rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

Claim 30 describes the phrase “polymers as claimed in claim 18,” which renders the claim indefinite. Claim 1 only describes a polymer, not polymers.

18. Claim 31 is rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

Claim 31 describes the phrase, “molecular weight expressed as intrinsic viscosity is at least 1.4 dl/g,” which renders the claim indefinite. The Examiner agrees that the molecular weight is related to the intrinsic viscosity but, molecular weight can not be expressed as intrinsic viscosity. To express the molecular weight as intrinsic viscosity more information is needed than which is provided by claim 31.

[DEALY et al. (Structure and Rheology of Molten Polymers) provides extrinsic evidence at section 2.5.2 that which depend on the polymer, the solvent and the temperature, and these empirical constants  $K_m$  and  $a$  are needed to calculate the molecular weight from the intrinsic viscosity.]

19. Claim 32 is rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

Claim 32 recites the limitation “fibers” in the fibers formed in step C).

There is insufficient antecedent basis for this limitation in the claim.

20. Claim 33 is rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

Claim 33 provides for the use of the polymer film as claimed in claim 25, but, since the claim does not set forth any steps involved in the method/process, it is unclear what method/process applicant is intending to encompass. A claim is indefinite where it merely recites a use without any active, positive steps delimiting how this use is actually practiced.

Claim 33 is rejected under 35 U.S.C. 101 because the claimed recitation of a use, without setting forth any steps involved in the process, results in an improper definition of a process, i.e., results in a claim which is not a proper process claim under 35 U.S.C. 101. See for example *Ex parte Dunki*, 153 USPQ 678 (Bd.App. 1967) and *Clinical Products, Ltd. v. Brenner*, 255 F. Supp. 131, 149 USPQ 475 (D.D.C. 1966).

### ***Double Patenting***

The nonstatutory double patenting rejection is based on a judicially created doctrine grounded in public policy (a policy reflected in the statute) so as to prevent the unjustified or improper timewise extension of the “right to exclude” granted by a patent and to prevent possible harassment by multiple assignees. A nonstatutory obviousness-type double patenting rejection is appropriate where the conflicting claims are not identical, but at least one examined application claim is not patentably distinct from the reference claim(s) because the examined application claim is either anticipated by, or would have been obvious over, the reference claim(s). See, e.g., *In re Berg*, 140 F.3d 1428, 46 USPQ2d 1226 (Fed. Cir. 1998); *In re Goodman*, 11 F.3d 1046, 29 USPQ2d 2010 (Fed. Cir. 1993); *In re Longi*, 759 F.2d 887, 225 USPQ 645 (Fed. Cir.

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1985); *In re Van Ornum*, 686 F.2d 937, 214 USPQ 761 (CCPA 1982); *In re Vogel*, 422 F.2d 438, 164 USPQ 619 (CCPA 1970); and *In re Thorington*, 418 F.2d 528, 163 USPQ 644 (CCPA 1969).

A timely filed terminal disclaimer in compliance with 37 CFR 1.321(c) or 1.321(d) may be used to overcome an actual or provisional rejection based on a nonstatutory double patenting ground provided the conflicting application or patent either is shown to be commonly owned with this application, or claims an invention made as a result of activities undertaken within the scope of a joint research agreement.

Effective January 1, 1994, a registered attorney or agent of record may sign a terminal disclaimer. A terminal disclaimer signed by the assignee must fully comply with 37 CFR 3.73(b).

21. Claims 1-4, 7, 9, 10, 20, and 23 are rejected on the ground of nonstatutory obviousness-type double patenting as being unpatentable over claims 39, 40, 46-48, 55, 61, 62, and 70 of U.S. Patent No. 7,384,552 B2.

Although the conflicting claims are not identical, they are not patentably distinct from each other because a person of ordinary skill in the art would conclude that the membrane as recited in the instant application claims clearly envisage the membrane of the patent because the copending application also claims proton-conducting polymer based on polyazoles which is obtained by a process.

Instant claim 1 is described at claim 39, A) mixing of one or more aromatic tetramino compounds with one or more aromatic carboxylic acids or esters thereof which contain at least two acid groups per carboxylic acid monomer, or mixing of one or more aromatic and/or heteroaromatic diaminocarboxylic acids, in phosphoric acid to form a solution and/or dispersion, B) heating of the mixture (i.e. solution and/or dispersion) obtained in step A) to temperatures of up to 350 °C. to form the polyazole polymer,

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- C) application of a layer using the mixture from step B) to a support,
- D) treatment of the layer (membrane) formed in step C).

Instant claim 2 is described at claim 46.

Many of the instant claim 3 compounds are described at claim 47.

Instant claim 4 is described at claim 48.

Instant claim 7 is described at claim 55.

Many of the instant claim 9 compounds are described at claim 61.

Many of the instant claim 10 compounds are described at claim 62.

Instant claim 20 is sufficiently described at claim 70.

Instant claim 23 is described at claim 40.

22. Claim 20 is rejected on the ground of nonstatutory obviousness-type double patenting as being unpatentable over claim 20 of U.S. Patent No. 7,582,210 B2.

Although the conflicting claims are not identical, they are not patentably distinct from each other because a person of ordinary skill in the art would conclude that the structure as recited in the instant application claims clearly envisages the structure of the U.S. Patent No. 7, 582,210 B2 claims.

Instant claim 20 is sufficiently described at claim 20.

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23. Claims 1, 2, 3, 5, 6, 7, 8, 9, 10 and 20 are rejected on the ground of nonstatutory obviousness-type double patenting as being unpatentable over claims 1, 2, 3, 5, 7, 9, 11, 15, 17, 18 and 23 of U.S. Patent No. 7,540,984 B2.

Although the conflicting claims are not identical, they are not patentably distinct from each other because a person of ordinary skill in the art would conclude that the structure as recited in the instant application claims clearly envisages the structure of the U.S. Patent No. 7,540,984 B2 claims.

Instant claim 1 is described at claim 1, A) mixing of one or more aromatic tetramino compounds with one or more aromatic carboxylic acids or esters thereof which contain at least two acid groups per carboxylic acid monomer, or mixing of one or more aromatic and/or heteroaromatic diaminocarboxylic acids, in phosphoric acid to form a solution and/or dispersion, B) heating of the mixture (i.e. solution and/or dispersion) obtained in step A) to temperatures of up to 350 °C. to form the polyazole polymer, C) application of a layer using the polymer (i.e. mixture) from step B) to a support, D) treatment of the membrane formed in step C).

Many of the instant claim 2 compounds are described at claim 2.

Many of the instant claim 3 compounds are described at claim 3

Many of the instant claim 5 compounds are described at claims 5 and 9.

Instant claim 6 the range significantly overlaps the described ranges at claims 7 and 8, thereby providing a prima facie case of obviousness.

Many of the instant claim 7 compounds are described at claim 11.

Many of the instant claim 8 compounds are described at claim 15.

Many of the instant claim 9 compounds are described at claim 17.

Many of the instant claim 10 compounds are described at claim 18.

Instant claim 20 is sufficiently described at claim 23.

### ***Claim Rejections - 35 USC § 102***

24. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(a) the invention was known or used by others in this country, or patented or described in a printed publication in this or a foreign country, before the invention thereof by the applicant for a patent.

25. Claims 1-4, 7, 9, 10, 20, and 23 are rejected under 35 U.S.C. 102(a) as being anticipated by CALUNDANN et al. (DE 10117686) ("CALUNDANN686").

For convenience, (US 7384552) is being used as a certified copy of (DE 10117686).

Instant claim 1 is described at claim 39, A) mixing of one or more aromatic tetraamino compounds with one or more aromatic carboxylic acids or esters thereof which contain at least two acid groups per carboxylic acid monomer, or mixing of one or more aromatic and/or heteroaromatic diaminocarboxylic acids, in phosphoric acid to form a solution and/or dispersion,

B) heating of the mixture (i.e. solution and/or dispersion) obtained in step A) to temperatures of up to 350 °C. to form the polyazole polymer,  
C) application of a layer using the mixture from step B) to a support,  
D) treatment of the layer (membrane) formed in step C).

Instant claim 2 is described at claim 46.

Many of the instant claim 3 compounds are described at claim 47.

Instant claim 4 is described at claim 48.

Instant claim 7 is described at claim 55.

Many of the instant claim 9 compounds are described at claim 61.

Many of the instant claim 10 compounds are described at claim 62.

Instant claim 20 is sufficiently described at claim 70.

Instant claim 23 is described at claim 40.

Applicant cannot rely upon the foreign priority papers to overcome this rejection because a translation of said papers has not been made of record in accordance with 37 CFR 1.55. See MPEP § 201.15.

26. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.



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27. Claims 1-4, 6-10, 18, 19, 24, 29, 30 and 32 are rejected under 35 U.S.C. 102(b) as being anticipated by CHOE (US 4,312,976).

For instant claims 1-4, 6-10, 18, 19, 24, 29, 30 and 32, CHOE teaches at the abstract and column 7 lines 27-47 and example 1 and claim 15 and claim 28 mixing 3,3',4,4'-tetraaminobiphenyl (aromatic tetraamino compound) with isophthalic acid (aromatic dicarboxylic acid) and conducting the polymerization with phosphoric acid to form a dispersion.

Also for instant claims 1-4, 6-10, 18, 19, 24, 29, 30 and 32, CHOE teaches at column 6 lines 20-26 heating the dispersion at a temperature of within the range of approximately 340 °C to 450 °C to form polybenzimidazole (polyazole polymer). The range of approximately 340 °C to 450 °C overlaps the claimed range of up to 350 °C.

Plus for instant claims 1-4, 6-10, 18, 19, 24, 29, 30 and 32, CHOE teaches at column 8 line 35-40 that the polymer of the invention can be employed as a film. It is the Examiner's position that to form a film inherently a support is needed.

Moreover for instant claims 1-4, 6-10, 18, 19, 24, 29, 30 and 32, CHOE does not specifically application of a layer using the polymer (from step B) to a support. But, CHOE teaches at example 1 a layer of the polymer (from step B) in the flask (support). As well, CHOE teaches at example 1 the resulting product was cooled to room temperature (treatment of the membrane formed in step C)). The application of the polymer to a support rather than leaving the polymer on

the support prior to cooling does not patentability differentiate the claimed product over the prior art.

In relation, MPEP 2113 describes the following...

“[E]ven though product-by-process claims are limited by and defined by the process, determination of patentability is based on the product itself. The patentability of a product does not depend on its method of production. If the product in the product-by-process claim is the same as or obvious from a product of the prior art, the claim is unpatentable even though the prior product was made by a different process.” In re Thorpe, 777 F.2d 695, 698, 227 USPQ 964, 966 (Fed. Cir. 1985)

Furthermore for instant claims 1-4, 6-10, 18, 19, 24, 25, 29, 30 and 32, CHOE teaches at column 7 lines 27-47 and example 1 and claim 15 and claim 28 phosphoric acid (catalytically active component).

What's more for instant claims 1-4, 6-10, 18, 19, 24, 25, 29, 30 and 32, CHOE teaches at column 4 lines 35-45 heterocyclic dicarboxylic acids.

In addition for instant claims 1-4, 6-10, 18, 19, 24, 25, 29, 30 and 32, CHOE teaches at column 3 lines 9-32 and column 5 lines 15-35

poly-2,2'-(pyridylene-3",5")-5,5'-bibenzimidazole. It is the Examiner's position that polymer of CHOE has benzimidazole units of the formula where n is an integer greater than or equal to 10, because of the substantial similarity

between the type of benzimidazole unit, reactants and process of making of  
CHOE and the current claims as already presented here in this rejection.

***Claim Rejections - 35 USC § 103***

28. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all  
obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

29. Claims 1, 5 and 15 are rejected under 35 U.S.C. 103(a) as being unpatentable  
over SHERATTE (US 4,154,919) in view of CHOE (US 4,312,976).

For instant claims 1, 5 and 15, SHERATTE teaches at the abstract, table  
1, column 6 lines 54-57, column 9 lines 20-45 and example 5 mixing an N,N'-bis  
(2-aminophenyl)-4,4' diamino-diphenyl (aromatic tetraamino) with a  
tetracarboxylic dianhydride such as 3,3',4,4'-biphenyltetracarboxylic dianhydride  
to form a solution. SHERATTE does not specifically teach mixture in phosphoric  
acid. But, SHERATTE teaches at the abstract forming polybenzimidazoles.  
Also, CHOE teaches at the abstract and column 7 lines 27-47 and example 1  
and claim 15 and claim 28 forming a polybenzimidazole with an tetraamino and  
aromatic carboxylic acid in phosphoric acid. Additionally, CHOE teaches at the  
abstract and column 7 lines 27-47 and example 1 and claim 15 and claim 28 the  
phosphoric acid acts as a catalyst. Therefore, it would have been obvious to one

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of ordinary skill in the art to provide the phosphoric acid of CHO<sub>2</sub>E in the mixture of SHERATTE for the benefit of catalyzing the reaction.

Also for instant claims 1, 5 and 15, SHERATTE teaches at the abstract, table 1, column 6 lines 54-57, column 9 lines 20-45 and example 5 heating of the solution at 215 °C to form the polymer. The temperature of 215 °C is within the claimed range of upto 350 °C, thereby providing a prima facie case of obviousness.

Additionally for instant claims 1, 5 and 15, SHERATTE teaches at claim 1 and 5 the polybenzimidazole polymer in the form of a film. It is the Examiner's position that to form a film obviously a support is needed.

Moreover, it is the Examiner's position that the formed polymer of SHERATTE inherently was held in a container (i.e. support) since, the polymer was formed from a solution (i.e. liquid). Also, it is the Examiner's position that the formed polymer of SHERATTE was a layer. The application of the polymer to a support rather than leaving the polymer on the support in which the polymer was formed does not patentability differentiate the claimed product over the prior art.

In relation, MPEP 2113 describes the following...

"[E]ven though product-by-process claims are limited by and defined by the process, determination of patentability is based on the product itself. The patentability of a product does not depend on its method of production. If the product in the product-by-process claim is the same as or obvious from a product of the prior art, the claim is

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unpatentable even though the prior product was made by a different process.” In re Thorpe, 777 F.2d 695, 698, 227 USPQ 964, 966 (Fed. Cir. 1985)

As well for instant claims 1, 5 and 15, SHERATTE teaches at the abstract, table 1, example 5 and 8 after forming the polybenzimidazole the polymer was dissolved in ethylene glycol (i.e. treatment of the membrane formed).

Furthermore for instant claims 1, 5 and 15, SHERATTE teaches at examples 3 and 14 a first cure (i.e. step B) and a post cure (i.e. step D treatment). It is the Examiner's position that some amount of tetracarboxylic acid would not crosslink (react) in the first cure, but would crosslink (react) in the second cure. This position of additional crosslinking is evidenced by SHERATTE'S example 4 wherein the inherent viscosity increases with the post cure.

30. Claim 14 is rejected under 35 U.S.C. 103(a) as being unpatentable over CHOE (US 4,312,976) in view of JENSVOLD et al. (US 5,409,524).

For instant claim 14, CHOE does not specifically teach the membrane produced in step C) is treated in step D) by the action of heat in the presence of atmospheric oxygen. But, CHOE teaches at the abstract and column 7 lines 27-47 and example 1 and claim 15 and claim 28 producing a polybenzimidazole. Also, KALNIN et al. teaches at the abstract obtaining membranes having improved selectivity. Additionally, KALNIN et al. teaches at column 1 lines 40-65

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the polymer is treated by the action of heat in the presence of oxygen (i.e. atmospheric oxygen). As well, KALNIN et al. teaches at column 2 lines 62 – 68 that the polymer can be polybenzimidazoles. It would have been obvious to one of ordinary skill in the art at the time the invention was made to provide the process of KALNIN et al. with polybenzimidazole of CHOE for the benefit of improved selectivity.

31. Claim 16 is rejected under 35 U.S.C. 103(a) as being unpatentable over CHOE (US 4,312,976) in view of DAVIS et al. (US 4,020,142).

For instant claim 16, CHOE does not specifically teach the membrane produced in step C) is crosslinked by treatment with sulfuric acid in step D). But, CHOE teaches at the abstract and column 7 lines 27-47 and example 1 and claim 15 and claim 28 producing a polybenzimidazole. Also, DAVIS et al. teaches at the abstract and column 6 lines 1-16 a method of crosslinking a polybenzimidazole with sulfuric acid. It would have been obvious to one of ordinary skill in the art to provide the crosslinking method of DAVIS et al. with the similar polybenzimidazole of CHOE, since DAVIS et al. teaches at the abstract such crosslinking produces a tougher membrane.

32. Claim 17 is rejected under 35 U.S.C. 103(a) as being unpatentable over CHOE (US 4,312,976) in view of SMITH et al. (US 6,151,042).

For instant claim 17, CHOE does not specifically teach characterized in that the membrane produced in step C) is crosslinked by action of IR or NIR light or by irradiation with  $\beta$ -rays in step D). But, CHOE teaches at the abstract and column 7 lines 27-47 and example 1 and claim 15 and claim 28 producing a polybenzimidazole. Also, SMITH et al. teaches at columns 41 and 42 polybenzimidazoles. Additionally, SMITH et al. teaches at column 22 lines 23-55 a polymer containing at least some monomer repeat units with a first, photosensitivity-imparting substituent photosensitivity-imparting substituent which enables crosslinking. As well, SMITH et al. teaches at column 22 lines 23-55 that the polymer can be a polybenzimidazole. Moreover, SMITH et al. teaches at column 50 lines 40-60 radiation which activates crosslinking can be infrared light. It would have been obvious to one of ordinary skill in the art to provide the crosslinking method of SMITH et al. with the similar polybenzimidazole of CHOE, for the benefit of crosslinking the polymer.

33. Claims 1, 12, 13, 20, 21, 22, 23, 25, 26 and 27 are rejected under 35 U.S.C. 103(a) as being unpatentable over CHOE (US 4,312,976) in view of WADHWA et al. (US 5,017,681).

For instant claims 1, 12, 13, 20, 21, 22, 23, 25, 26 and 27, CHOE teaches at the abstract and column 7 lines 27-47 and example 1 and claim 15 and claim 28 mixing 3,3',4,4'-tetraaminobiphenyl (aromatic tetraamino compound) with

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isophthalic acid (aromatic dicarboxylic acid) and conducting the polymerization with phosphoric acid to form a dispersion.

Also for instant claims 1, 12, 13, 20, 21, 22, 23, 25, 26 and 27, CHOE teaches at column 6 lines 20-26 heating the dispersion at a temperature of within the range of approximately 340 °C to 450 °C to form polybenzimidazole (polyazole polymer). The range of approximately 340 °C to 450 °C overlaps the claimed range of up to 350 °C

For instant claims 1, 12, 13, 20, 21, 22, 23, 25, 26 and 27, CHOE teaches at column 8 lines 35-40 polybenzimidazoles produced by the process of the present invention exhibit high heat stability and can be employed in the production of various formed articles, such as fibers, films. Though, CHOE teaches little of the particulars of the process for producing a polybenzimidazole film, WADHWA et al. teaches at the abstract numerous details of the process for producing a polybenzimidazole film. Therefore, it would have been obvious to one of ordinary skill in the art to prepare the polybenzimidazole film of CHOE by employing the process of WADHWA et al.

Moreover for instant claims 1, 12, 13, 20, 21, 22, 23, 25, 26 and 27, WADHWA et al. teaches at the title polybenzimidazole film (polymer film which is based on polyazoles).

Also for instant claims 1, 12, 13, 20, 21, 22, 23, 25, 26 and 27, WADHWA et al. teaches at the abstract continuously casting the solution upon a support (application of a layer to a support using the polyazole polymer).



For instant claims 1, 12, 13, 20, 21, 22, 23, 25, 26 and 27, WADHWA et al. teaches at supports can be stainless steel (i.e. an electrode).

Additionally for instant claims 1, 12, 13, 20, 21, 22, 23, 25, 26 and 27, WADHWA et al. teaches at the abstract evaporating a sufficient amount of the solvent to form a self-supporting film in an oven (treatment of the layer until it is self-supporting). WADHWA et al. teaches at column 4 lines 54-60 the support allows the film to be readily separated or removed without tearing the film (i.e. detached from the support without damage).

Plus for instant claims 1, 12, 13, 20, 21, 22, 23, 25, 26 and 27, WADHWA et al. teaches at the abstract and examples 1 and 2 removing the film from the support (detachment of the layer from the support).

As well for instant claims 1, 12, 13, 20, 21, 22, 23, 25, 26 and 27, WADHWA et al. teaches at the abstract and examples 1 and 2 rinsing the film with deionized water and drying (i.e. removal of the phosphoric acid present and drying.)

34. Claim 11 is rejected under 35 U.S.C. 103(a) as being unpatentable over CHOE (US 4,312,976) in view of WADHWA et al. (US 5,017,681) as applied to claims 1, 12, 13, 20, 21, 22, 23 and 26 above, and further in view of WAINRIGHT et al. (Acid-Doped Polybenzimidazoles: A New Polymer Electrolyte), and SHERATTE (US 4,154,919).

For instant claim 11, CHOE does not specifically teach the viscosity is adjusted by addition of phosphoric acid after step B) and before step C). But,

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CHOE teaches at the abstract and column 7 lines 27-47 and example 1 and claim 15 and claim 28 the phosphoric acid in the polymerization process acts as a catalyst. Also, WAINRIGHT et al. teaches at the experimental section that it is known to add phosphoric acid to a polybenzimidazole film. As well, SHERATTE teaches at example 6 inherent viscosity (intrinsic viscosity) of the polymer adjusted by varying the time and temperature during the polymerization process. Therefore, it would have been obvious to one of ordinary skill in the art to provide phosphoric acid after step B) and before step C) to effect polymerization (therefore effecting viscosity), since CHOE teaches phosphoric is a catalyst, WAINRIGHT teaches adding phosphoric acid to a polybenzimidazole film, and SHERATTE teaches adjusting viscosity of the polymer.

35. Claims 31 is rejected under 35 U.S.C. 103(a) as being unpatentable over CHOE (US 4,312,976) in view of LETINSKI et al. (US 4,810,730) and SHERATTE (US 4,154,919).

For instant claim 31, teaches at claim 1 and 2 polybenzimidazole (polymer based polyazole) with an inherent viscosity of at least approximately 0.5 dl/g which overlaps the claimed intrinsic viscosity of at least 1.4 dl/g. As well, SHERATTE teaches at example 6 that inherent viscosity (intrinsic viscosity) is a result-effective variable of time and temperature during the polymerization process.

For instant claim 31, CHOE teaches at the abstract and column 7 lines 27-47 and example 1 and claim 15 and claim 28 mixing 3,3',4,4'-tetraaminobiphenyl (aromatic tetraamino compound) with isophthalic acid (aromatic dicarboxylic acid) and conducting the polymerization with phosphoric acid to form a dispersion.

Also for instant claim 31, CHOE teaches at column 6 lines 20-26 heating the dispersion at a temperature of within the range of approximately 340 °C to 450 °C to form polybenzimidazole (polyazole polymer). The range of approximately 340 °C to 450 °C overlaps the claimed range of up to 350 °C

Additionally for instant claim 31, CHOE does not specifically teach C) extrusion of the polyazole polymer formed in step B) to form fibers, D) introduction of the fibers formed in step C) into a liquid bath, E) isolation and drying of the fibers obtained. But, CHOE teaches at column 8 lines 35-40 polybenzimidazoles produced by the process of the present invention exhibit high heat stability and can be employed in the production of various formed articles, such as fibers. Though, CHOE teaches little of the particulars of the process for producing a polybenzimidazole fiber, LETINSKI et al. teaches at the abstract and example 1 numerous details of the process for producing a polybenzimidazole fiber (filaments). LETINSKI et al. teaches at the abstract and example 1 extrusion of the polyazole polymer, introduction of the polymer into a liquid bath, cutting (isolation) and drying of the fibers obtained. Therefore, it would have

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been obvious to one of ordinary skill in the art to prepare the polybenzimidazole fiber of CHOE by employing the process of LETINSKI et al.

### ***Conclusion***

36. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

a. SAVINELL et al. (US 5,525,436) Proton Conducting Polymers Used as Membranes.

37. Any inquiry concerning this communication or earlier communications from the examiner should be directed to ANTHONY SHUMATE whose telephone number is (571)270-5546. The examiner can normally be reached on M-Th 9-4pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Michael Marcheschi can be reached on (571)272-1374. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

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/A.S./

Examiner Art Unit 1797

/Jason M. Greene/

Primary Examiner, Art Unit 1797